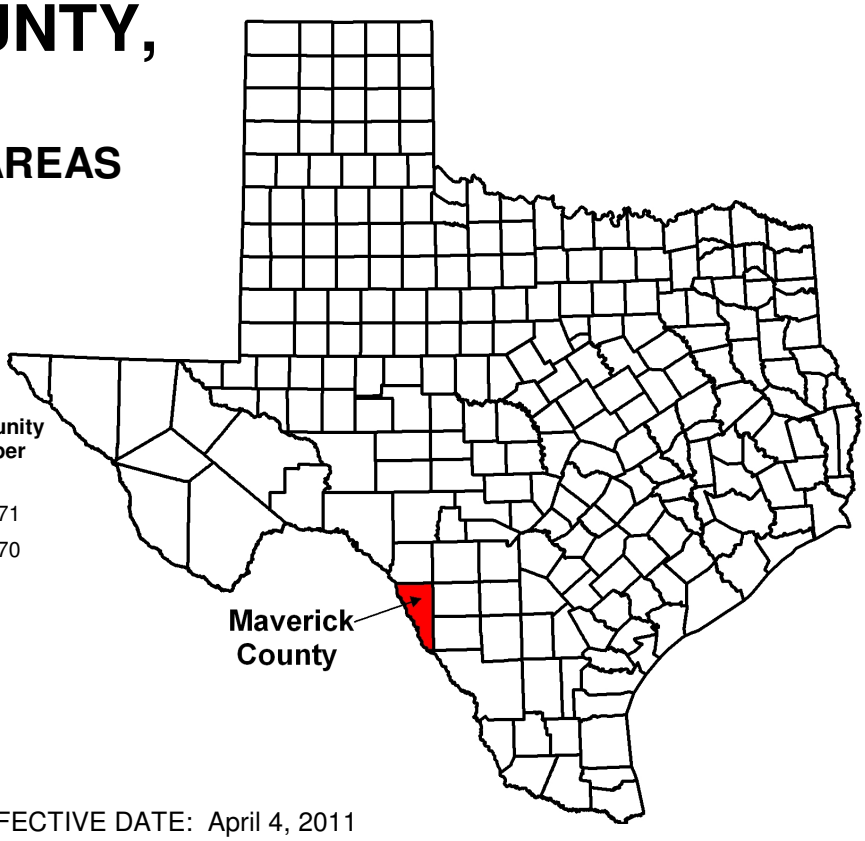
FLOOD INSURANCE STUDY

MAVERICK COUNTY, TEXAS
AND INCORPORATED AREAS

Community Name	Community Number
EAGLE PASS, CITY OF	480471
MAVERICK COUNTY	480470



EFFECTIVE DATE: April 4, 2011

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
48323CV000A

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Selected Flood Insurance Rate Map panels for the community contain information that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels (e.g., floodways, cross sections).

Part or all of this Flood Insurance Study may be revised and republished at any time. In addition, part of this Flood Insurance Study may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the Flood Insurance Study. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current Flood Insurance Study components.

Initial Countywide FIS Effective Date: April 4, 2011

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FLOOD INSURANCE STUDY
MAVERICK COUNTY, TEXAS AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of Maverick County; including the City of Eagle Pass and the unincorporated areas of Maverick County (referred to collectively herein as Maverick County) and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR 60.3.

In some States or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence, and the State (or other jurisdictional agency) will be able to explain them.

The Digital Flood Insurance Rate Map (DFIRM) and FIS report for this countywide study have been produced in digital format. Flood hazard information was converted to meet the Federal Emergency Management Agency (FEMA) DFIRM database specifications and Geographic Information System (GIS) format requirements. The flood hazard information was created and is provided in a digital format so that it can be incorporated into a local GIS and be accessed more easily by the community.

1.2 Authority and Acknowledgments

The sources of authority for this FIS report are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

This FIS was prepared to include all jurisdictions within Maverick County in a countywide FIS. The authority and acknowledgements prior to this countywide FIS were compiled from the previously identified FIS reports for flood prone jurisdictions within Maverick County and are shown below:

Eagle Pass, City of: For the original study, the hydrologic and hydraulic analyses were performed by URS/Forrest and Cotton, Inc., Consulting Engineers, Austin, Texas, for the Federal Insurance Administration (FIA), under Contract No. H-4643. That study was completed in January 1980 (Reference 1). The hydrologic and hydraulic analyses for the 2005 revision were performed by Halff Associates, Inc., for the City of Eagle Pass, Maverick County, Texas. That study was completed in August 1999.

For this first countywide study, MAPVI compiled existing data to convert the previous City of Eagle Pass FIS into digital format. MAPVI completed this work in April 2009, under Contract No. EMT-2002-CO-0052.

Base map information used to develop the Flood Insurance Rate Maps (FIRMs) that correspond to this FIS was derived from multiple sources. This information was compiled from the U.S. Geological Survey (USGS), 1989 and 1999; the National Geodetic Survey, 2004; and the Texas Natural Resource Information System, 2007.

The projection used in the preparation of the FIRMs was the Texas State Plane Coordinate Grid System, South Central Zone (FIPS 4204). The horizontal datum is the North American Datum 1983 (NAD83) and the vertical datum is the North American Vertical Datum 1988 (NAVD88). Differences in datum, projection or State Plane zones used in the production of the FIRMs for adjacent jurisdictions may result in slight positional differences across jurisdictional boundaries. These differences do not affect the accuracy of these FIRMs.

1.3 Coordination

An initial Consultation Coordination Officer (CCO) meeting is held with representatives from FEMA, the community, and the study contractor to explain the nature and purpose of a FIS, and to identify the streams to be studied by detailed methods. A final CCO meeting is held with representatives from FEMA, the community, and the study contractor to review the results of the study. All problems raised in the meeting have been addressed in this study.

Eagle Pass, City of: For the original study, an initial CCO meeting was held on March 15, 1978 to discuss the nature and purpose of the study and limits of the work. That meeting was attended by representatives of URS/Forrest and Cotton, Inc., the FIA, and representatives of the City of Eagle Pass. A legal notice announcing the beginning of the study and stating its objectives was placed in the local newspapers. During the course of the study, preliminary results of the hydrologic analyses were submitted to the Soil Conservation Service (SCS), U.S. Army Corps of Engineers (USACE), and the International Boundary and Water Commission (IBWC) for their review. In addition, officials of the City of Eagle Pass were periodically advised of the progress of the study. The preliminary results of the study were presented at an intermediate coordination meeting attended by City of Eagle Pass officials, representatives of HA and URS/Forrest and Cotton, Inc. A final CCO meeting was held on June 23, 1980, to review the report with representatives of URS/Forrest and Cotton, Inc., the HA, and officials of the City of Eagle Pass in attendance.

For the 2005 revision, the City of Eagle Pass was notified by the Federal Emergency Management Agency (FEMA) in a letter dated December 5, 2001, that a revision to the FIS was being prepared. A final CCO meeting was held on September 1, 2004 with representatives of FEMA and officials from the City of Eagle Pass in attendance.

For this countywide revision, an initial CCO meeting was held on June 22, 2007, and was attended by representatives of the community, the study contractor, and FEMA. A final CCO meeting was held on September 22, 2009, and was attended by representatives of the community, the study contractor, and FEMA.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS report covers the geographic area of Maverick County, Texas. The areas studied by detailed and approximate methods were selected with priority given to all known flood hazards and areas of projected development or proposed construction through August 1999.

All or portions of the flooding sources listed in Table 1, "Flooding Sources Studied by Detailed Methods," were previously studied by detailed methods. Those limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and on the FIRMs (Exhibit 2).

For this countywide study, all flooding sources that had been previously studied by detailed methods and not subsequently restudied were redelineated. This process consisted of updating the floodplain boundaries based on the most current topographic data. New hydrologic and hydraulic analyses were not performed on the redelineated flooding sources.

For this countywide study, all flooding sources that had been previously studied by approximate methods and not subsequently restudied were refined. This process consisted of digitizing the Zone A floodplain boundaries from the previous FIRMs and then further refining the boundaries based on the most recent contour data. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon, by FEMA and the City of Eagle Pass.

Table 1 – Flooding Sources Studied by Detailed Methods

Stream	Limits of Detailed Study
Eagle Pass Creek	From the confluence with Rio Grande River to a point approximately 190 feet upstream of Vista Hermosa Drive
Eagle Pass Creek Tributary 1	From the confluence with Eagle Pass Creek to a point approximately 325 feet upstream of Travis Street
Eagle Pass Creek Tributary 2	From the confluence with Eagle Pass Creek to a point approximately 2,110 feet upstream of North Bibb Avenue

Table 1 – Flooding Sources Studied by Detailed Methods (continued)

Stream	Limits of Detailed Study
Rio Grande	From approximately 1,900 feet downstream of International Union Pacific Railroad Bridge to a point approximately 5,780 feet upstream of East Garrison Street/U.S. Highway 57
Tributary to Seco Creek	From approximately 100 feet downstream of U.S. Highway 277 to a point approximately 1,190 feet upstream of U.S. Highway 277
Unnamed Tributary of Rio Grande	From approximately 1,610 feet downstream of FM 3443 to a point approximately 1,630 feet upstream of East Main Street

There were no Letters of Map Change (LOMCs) that affected the mapping update of this county; therefore no LOMCs have been incorporated into this countywide study.

2.2 Community Description

Maverick County is located in southwest Texas in the northwestern portion of the Rio Grande plain region. The county has an area of approximately 1,287 square miles. Maverick County is bordered by Kinney County to the north, Zavala and Dimmit Counties to the east, Webb County to the south, and Mexico to the southwest. The population of Maverick County was 47,297 at the 2000 census with about 22,413 people residing in Eagle Pass, the county seat (Reference 2). Since the last census, it's estimated that the population of the county has increased to just over 51,656 and Eagle Pass has grown to 26,285 people (Reference 3).

The topography within Maverick County is primarily flat, with land to the south containing a more rolling landscape. The land is not good for farming, and agriculture primarily depends on irrigation from the Rio Grande through the Maverick County Irrigation Canal system. Vegetation in the county is primarily Mesquite brush and Blackbrush Brush (Reference 4).

The climate for the county is subtropical steppe. The region can get temperatures as high as 115 degrees Fahrenheit on occasion, but humidity is low. Rainfall is highly variable with annual rainfall ranging from a low of 6 inches to a high of 44 inches. The average from 1939 through 1968 was 19.52 inches annually. Water falling in the western part of the county drains into the Rio Grande, and the eastern half drains to the Nueces River (Reference 4).

Eagle Pass, City of: The City of Eagle Pass is located on the Mexican border of Maverick County, approximately 55 miles southeast of Del Rio, Texas. The City serves as the county seat and commercial center of Maverick County, also serving the population of the surrounding area, and Piedras Negras, Mexico. Eagle Pass is also a major international port of the United States - Mexico border and has been designated as a Model City by the Department of Housing and Urban Development (Reference 5).

The topography in and around Eagle Pass ranges from a gently sloping to a gently undulating terrain of predominantly calcareous loam, with some clay and gravel. The predominant soil series include Verick, Jimenez, and Zapata (a good source of Caliche). Most of these soils are suitable for range, wildlife habitat, and some irrigation farming (Reference 6). Stream slopes vary in grade from 0.4-percent to 0.2-percent.

Eagle Pass has a subtropical steppe climate characterized by low humidity, hot summers and mild winters. More than three-fourths of the annual precipitation (19.5 inches) occurs in the months of April to October, most often in the form of thunderstorms. The evaporation rate is high in this relatively dry climate, being about 78 inches annually from a free-water source. Temperature extremes have ranged from 7 to 115 degrees Fahrenheit (References 6).

2.3 Principal Flood Problems

There are no known flood problems in the other incorporated areas or the unincorporated areas of Maverick County. Because there is no previously printed FIS report for the unincorporated areas of Maverick County, the principal flood problems that prompted the development of the effective A Zones are not known. According to the National Climatic Data Center, there were 32 flash flood events reported in Maverick County between January 1, 1950 and November 30, 2008 (Reference 7).

Eagle Pass, City of: The City of Eagle Pass experiences flooding from two main sources: the Rio Grande and Eagle Pass Creek. Streams generally flow from east to west towards the Rio Grande through Eagle Pass. Streams located to the south generally flow south to agricultural areas. A major irrigation ditch identified as the Maverick County Canal carries irrigation water to large parts of the County located to the south of Eagle Pass.

Damaging floods have occurred in Eagle Pass in 1954, 1963, 1964, 1967, 1969, 1970, and 1983. Flooding on the Rio Grande is fed by a drainage basin of approximately 127,000 square miles, which is enhanced by tropical storms that occasionally move inland along the Rio Grande or through northern Mexico. In June of 1954, Hurricane Alice moved inland up the Rio Grande from the Gulf of Mexico south of Brownsville. Rainfalls of as much as 27.1 inches in 48 hours resulted in the greatest flood in the middle Rio Grande since June 1865. Rises of 50 to 60 feet, or 30 to 40 feet above flood stage, occurred at Eagle Pass within 48 hours (Reference 8).

The construction of Amistad Dam (completed in 1969) on the Rio Grande (73 miles upstream of Eagle Pass) has reduced but not eliminated flood damages from the Rio Grande. Flooding potential from Eagle Pass Creek and its tributaries has increased in recent years due to a combination of urbanization and inadequate bridge and culvert openings. There are no stream gauging records and insufficient high water marks to estimate flows for Eagle Pass Creek for any of these periods.

2.4 Flood Protection Measures

There are no known flood protection measures in place within the unincorporated areas of Maverick County.

Eagle Pass, City of: The completion of the Amistad Dam in 1969 has significantly reduced flood damage from the Rio Grande at Eagle Pass. The dam, located 73 miles upstream of

Eagle Pass and 12 miles northwest of Del Rio, Texas, forms the Amistad Reservoir which has a flood control storage capacity of 5,249,700 acre-feet (Reference 9).

Within the City, major channelization work was done along most all of the segments of Eagle Pass Creek and its two tributaries. The design work for this channelization project was performed by the consulting engineering firm of Groves, Fernandez, Frazer, Telford, and Associates, Inc., of San Antonio, Texas. This channelization work serves to increase the hydraulic efficiency, and thus the water carrying capacity of the channelized segment involved, but has not completely eliminated flood hazards along the entire reach of the channels.

No flood protection measures have been initiated for the Tributary to Seco Creek and the Unnamed Tributary of Rio Grande.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the community, standard hydrologic and hydraulic study methods were used to determine the flood-hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, which are commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent-annual-chance flood in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this FIS. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses establish peak discharge frequency relationships for each flooding source studied by detailed methods affecting the community. For each community within Maverick County that had a previously printed FIS report, the hydrologic analyses described in those reports have been compiled and are summarized below.

Eagle Pass, City of: Thunderstorms generate runoff that can cause flooding. To determine the amount of runoff from a storm, engineers have to either measure or estimate the amount of water runoff from the watershed. Since no stream gages exist on Eagle Pass Creek or its tributaries to measure runoff, an estimate of the water runoff was necessary. The method used in this study is the SCS method. The SCS method requires the determination of certain watershed parameters. These parameters include the lag time, drainage area, and a curve number dependent on soil, and land use characteristics.

The USACE HEC-HMS (Reference 10) computer program was used to model the existing watersheds in Eagle Pass. Flows for the Rio Grande were obtained from the IBWC. Flows for Eagle Pass Creek and its tributaries, Tributary to Seco Creek, and the Unnamed Tributary of Rio Grande were calculated using the SCS methods in HEC-HMS.

Peak discharge-drainage area relationships for the flooding sources studied in detail are shown in Table 2, "Summary of Discharges."

Table 2 – Summary of Discharges

Flooding Source and Location	Drainage Area (mi^2)	Peak Discharges (cfs)) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Perecent-Annual-Chance
Eagle Pass Creek					
Just upstream of Golf Cart Crossing	3.26	2,970	4,830	5,710	7,450
Approximately 500 feet downstream of East Garrison Street (most downstream crossing)	3.13	2,850	4,650	5,510	7,200
At North Ceylon Street	2.94	2,570	4,230	5,030	6,600
At Garrison Street (most upstream crossing)	2.29	1,770	2,980	3,570	4,700
Just upstream of Quarry Street	2.01	1,450	2,460	2,960	3,900
Approximately 300 feet downstream of Concho Street	1.76	1,220	2,080	2,490	3,260
Just upstream of Concho Street	0.67	680	1,130	1,360	1,830
Approximately 450 feet downstream of Kelso Drive	0.50	540	880	1,040	1,400
Approximately 175 feet upstream of Vista Hermosa Drive	0.20	250	410	480	640
Eagle Pass Creek Tributary 1					
At Pierce Street	0.56	840	1,310	1,520	1,970
Just upstream of Crockett Street	0.47	620	950	1,110	1,430

Table 2 – Summary of Discharges (continued)

Flooding Source and Location	Drainage Area (mi^2)	Peak Discharges (cfs)) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Perecent-Annual-Chance
Eagle Pass Creek Tributary 2					
Just downstream of First Street	1.09	740	1,250	1,490	1,960
Just upstream of First Street	1.07	730	1,230	1,470	1,940
Approximately 300 feet downstream of Memorial Drive	0.68	520	870	1,050	1,410
Approximately 200 feet upstream of North Bibb Avenue	0.30	330	510	590	760
Rio Grande					
Approximately 5,600 feet upstream of East Garrison Street	135,000	90,000	180,000	230,000	350,000
Tributary to Seco Creek					
Just downstream of U.S Highway 277	0.48	450	750	870	1,130
Unnamed Tributary of Rio Grande					
At FM 3443 (most downstream crossing)	3.27	2,080	3,580	4,440	6,070
Approximately 300 feet upstream of Cherry Leaf	1.99	1,540	2,710	3,290	4,350
Approximately 1,650 feet upstream of Cherry Leaf Drive	1.85	1,490	2,590	3,130	4,100
Approximately 1,400 feet downstream of East Main Street	1.57	1,280	2,210	2,670	3,490
Approximately 225 feet downstream of East Main Street	1.20	1,090	1,860	2,220	2,940
Approximately 1,625 feet upstream of East Main Street	0.98	920	1,520	1,820	2,420

Because there is no previously printed FIS report for the unincorporated areas of Maverick County, the hydrologic analyses used to develop the effective A Zones shown on the FIRMs are not known. No new hydrologic analysis was performed for this countywide FIS.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data tables in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1). Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed (Section 4.2), selected cross section locations are always shown on the FIRM (Exhibit 2).

For each community within Maverick County that had a previously printed FIS report, the hydraulic analyses described in those reports have been compiled and summarized below.

Eagle Pass, City of: For the original study and 2005 revision, cross section data for all streams studied were obtained from field surveys and highway plans, supplemented by aerial photography (Reference 11). For the 2005 revision, water surface elevations (WSELs) for the streams studied in detail were computed through the use of the USACE HEC-RAS step-backwater computer program (Reference 12). Starting WSELs were computed by the normal-depth method.

Channel roughness factors (Manning's "n" values) for the hydraulic computations were assigned on the basis of field inspection of the floodplain areas. The channel "n" and overbank "n" values for all flooding sources studied in detail are shown in Table 3, “Manning’s “n” Values.”

Table 3 – Manning’s "n" Values

Stream	Channel “n”	Overbank “n”
Eagle Pass Creek	0.015 - 0.045	0.035 - 0.065
Eagle Pass Creek Tributary 1	0.015 - 0.023	0.022 - 0.085
Eagle Pass Creek Tributary 2	0.015 - 0.040	0.021 - 0.080
Rio Grande	0.030 - 0.051	0.040 - 0.060
Tributary to Seco Creek	0.030 - 0.080	0.030 - 0.080
Unnamed Tributary of Rio Grande	0.015 - 0.080	0.015 - 0.100

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Because there is no previously printed FIS report for the unincorporated areas of Maverick County, the hydraulic analyses used to develop the effective A Zones shown on the FIRMs are not known. No new hydraulic analysis was performed as part of this countywide FIS.

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD29). With the completion of the NAVD88, many FIS reports and FIRMs are now prepared using NAVD as the referenced vertical datum.

Flood elevations shown in this FIS report and on the FIRM are referenced to the NAVD88. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. It is important to note that adjacent counties may be referenced to NGVD29. This may result in differences in base flood elevations (BFEs) across the county boundaries between the counties.

For this countywide revision, the Flood Profiles and BFEs were revised to reflect the new datum values. Prior versions of the FIS report and FIRM for the City of Eagle Pass in Maverick County were referenced to NGVD29 (Reference 13). To accurately convert flood elevations for the City of Eagle Pass from the current NGVD29 to the newer NAVD88 datum, the following procedure was implemented. The vertical datum shift was calculated for each corner of the USGS 7.5-minute quadrangle maps located inside or within 2.5 miles of the corporate limits of the City of Eagle Pass using the National Geodetic Survey (NGS) VERTCON software version 2.10, which is approved by FEMA (Reference 14). The resulting average conversion factor of +0.45 feet was applied to all components of the FIS that display flood elevations.

The BFEs shown on the FIRM represent whole-foot rounded values. For example, a BFE of 102.4 will appear as 102 on the FIRM and 102.6 will appear as 103. Therefore, users that wish to convert the elevations in this FIS to NGVD29 should apply the stated conversion factor to elevations shown on the Flood Profiles and supporting data tables in the FIS report, which are shown, at a minimum, to the nearest 0.1 foot.

For information regarding conversion between the NGVD29 and NAVD88, visit the National Geodetic Survey website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

Vertical Network Branch, N/CG13
National Geodetic Survey, NOAA
Silver Spring Metro Center 3
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS report provides 1-percent-annual-chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2-percent-annual-chance flood elevations; delineations of the 1- and 0.2-percent-annual-chance floodplains; and a 1-percent-annual-chance floodway. This information is presented on the FIRM and in many components of the FIS report including: Flood Profiles, Floodway Data tables, and Summary of Stillwater Elevation tables. Users should reference the data presented in the FIS report as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. The original floodplain boundaries were interpolated between cross sections using topographical maps at a scale of 1:3,000, with a contour interval of two feet (Reference 11). This information was taken from the 2005 revision of the City of Eagle Pass Flood Insurance Study.

In this countywide study, 10-meter and 30-meter Digital Elevation Model (DEM) topographic data was provided by the USGS. This data was used to determine the floodplain boundaries of approximate analyses areas.

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRMs (Exhibit 2). On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations, but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

The original detailed study analyses for the City of Eagle Pass were performed using detailed survey. For this countywide study, the available terrain is less accurate than detailed survey. Therefore, flooding was digitized from the effective FIRMs for the City of Eagle Pass. Available terrain data was used where appropriate to complete the floodplain delineations.

Work maps provided by FEMA were used to redelineate portions of the Unnamed Tributary of Rio Grande, outside of the City of Eagle Pass corporate limits. These work maps were developed as part of the effective FIS for the City of Eagle Pass; however, flooding outside of the corporate limits was excluded from the FIRMs for the City of Eagle Pass.

For the streams studied by approximate methods, only the 1-percent-annual-chance floodplain boundary is shown on the FIRM. Approximate 1-percent-annual-chance floodplain

boundaries were taken directly from the previous FIRMs for the City of Eagle Pass (Reference 13) and the unincorporated areas of Maverick County (Reference 15).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the base flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal-conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (see Table 5, Floodway Data). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

Encroachment into areas subject to inundation by floodwaters having hazardous velocities aggravates the risk of flood damage and heightens potential flood hazards by further increasing velocities. A listing of stream velocities at selected cross sections is provided in Table 5, "Floodway Data." To reduce the risk of property damage in areas where the stream velocities are high, the community may wish to restrict development in areas outside the floodway.

Along streams where floodways have not been computed, the community must ensure that the cumulative effect of development in the floodplains will not cause more than a 1.0-foot increase in the BFEs at any point within the county.

The area between the floodway and 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation (WSEL) of the base flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1.

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION			
CROSS-SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
EAGLE PASS CREEK								
A	2,056[1]	74	445	12.4	716.3	706.2[3]	706.3	0.1
B	2,745[1]	120	1,596	3.5	722.9	722.9	723.5	0.6
C	3,429[1]	122	1,578	3.2	723.2	723.2	723.7	0.5
D	4,272[1]	125	1,133	4.4	723.8	723.8	724.1	0.3
E	6,009[1]	40	385	7.7	726.9	726.9	727.8	0.9
F	7,452[1]	70	536	4.7	731.8	731.8	732.4	0.6
G	8,489[1]	37	194	12.9	732.6	732.6	732.6	0.0
H	10,291[1]	46	210	5.0	744.5	744.5	744.5	0.0
I	11,792[1]	100	184	5.6	758.5	758.5	758.6	0.1
J	13,164[1]	46	77	6.3	768.2	768.2	768.2	0.0
K	13,965[1]	78	113	4.2	776.3	776.3	776.4	0.1
L	14,731[1]	33	78	6.2	784.1	784.1	784.1	0.0
EAGLE PASS CREEK TRIBUTARY 1								
A	158[2]	30	128	11.8	724.8	718.1[4]	718.1	0.0
B	556[2]	36	137	11.1	724.8	721.5[4]	721.5	0.0
C	1,131[2]	27	101	10.9	730.5	730.5	730.5	0.0
D	1,670[2]	25	154	4.9	735.7	735.7	736.4	0.7
E	2,227[2]	38	158	4.8	740.0	740.0	740.6	0.6
EAGLE PASS CREEK TRIBUTARY 2								
A	300[2]	115	325	4.6	743.9	743.9	744.7	0.8
B	638[2]	300	668	2.2	747.1	747.1	747.7	0.6
C	1,568[2]	350	378	2.8	750.9	750.9	750.9	0.0
D	2,411[2]	100	181	5.8	754.8	754.8	755.4	0.6
E	3,648[2]	280	414	2.5	761.0	761.0	761.3	0.3
F	4,751[2]	100	177	3.3	768.0	768.0	768.8	0.8
G	5,671[2]	100	169	3.5	776.2	776.2	776.3	0.1
H	6,491[2]	100	108	1.4	781.2	781.2	781.3	0.1
J	7,691[2]	86	45	3.3	791.2	791.2	791.2	0.0

[1] Feet above confluence with Rio Grande

[2] Feet above confluence with Eagle Pass Creek

[3] Elevations computed without consideration of backwater effects from Rio Grande

[4] Elevations computed without consideration of backwater effects from Eagle Pass Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MAVERICK COUNTY, TX AND INCORPORATED AREAS

FLOODWAY DATA

EAGLE PASS CREEK, TRIBUTARY 1, AND TRIBUTARY 2

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION			
CROSS-SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
RIO GRANDE								
A	530[1]	1237	27,267	8.4	711.1	711.1	711.7	0.6
B	1,170[1]	1310	24,968	9.2	711.7	711.7	712.3	0.6
C	2,315[1]	1285	25,327	9.1	713.1	713.1	713.7	0.6
D	3,211[1]	1350	28,570	8.1	714.9	714.9	715.3	0.4
E	6,446[1]	1750	38,101	6.0	717.0	717.0	717.5	0.5
F	8,686[1]	1543	21,807	10.2	717.7	717.7	718.3	0.6
G	10,461[1]	1346	33,992	6.7	722.4	722.4	722.5	0.1
TRIBUTARY TO SECO CREEK								
A	2,714[2]	101	150	2.7	740.7	740.7	740.9	0.2
B	3,444[2]	74	128	3.2	743.6	743.6	743.7	0.1
UNNAMED TRIBUTARY OF RIO GRANDE								
A	50[1]	371	1,308	3.2	739.8	739.8	740.4	0.6
B	1,063[1]	159	697	5.5	742.8	742.8	743.1	0.3
C	2,260[1]	500	1,119	3.5	747.1	747.1	747.1	0.0
D	2,972[1]	610	1,772	2.2	749.2	749.2	749.3	0.1
E	4,433[1]	360	1,100	2.9	754.6	754.6	755.4	0.8
F	5,993[1]	343	1,226	2.2	759.6	759.6	759.8	0.2
G	7,650[1]	265	456	4.9	765.0	765.0	765.3	0.3
H	9,291[1]	222	462	3.9	772.0	772.0	772.4	0.4

[1] Feet above Eagle Pass corporate limits

[2] Feet above confluence with Seco Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MAVERICK COUNTY, TX AND INCORPORATED AREAS

FLOODWAY DATA

RIO GRANDE, TRIBUTARY TO SECO CREEK, AND UNNAMED TRIBUTARY TO RIO GRANDE

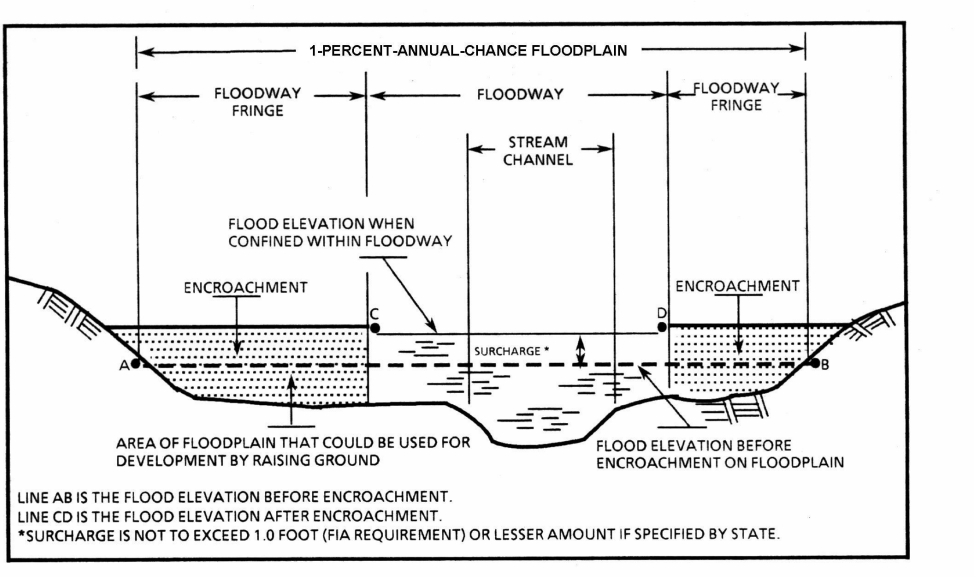

Figure 1 - Floodway Schematic

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base (1-percent-annual-chance) flood elevations (BFEs) or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by detailed methods. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile (sq. mi.), and areas protected from the base flood by levees. No BFEs or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 1-percent-annual-chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent-annual-chance floodplains, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The current countywide FIRMs present flooding information for the entire geographic area of Maverick County. These countywide FIRMs also include flood-hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFMs), where applicable. Historical data relating to the maps prepared for each community are presented in Table 5, "Community Map History."

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE(S)	FLOOD INSURANCE RATE MAP EFFECTIVE DATE	FLOOD INSURANCE RATE MAP REVISION DATE(S)
Eagle Pass, City of	May 24, 1974	January 2, 1976	June 1, 1981	October 19, 2005
Maverick County (Unincorporated Areas)	December 20, 1977	NONE	December 20, 1977	NONE

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MAVERICK COUNTY, TX AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

A Flood Insurance Study and FIRM have been published for the City of Eagle Pass in Maverick County (Reference 13). No previous studies have been prepared for other incorporated areas, or the unincorporated areas of Maverick County. The flood study that resulted in the creation of A Zones in the previous FIRMs for the unincorporated areas of Maverick County was not published. A recent Flood Insurance Study has been completed for Webb County, Texas, (Reference 16) which borders Maverick County to the south. An FIS is ongoing for Uvalde County, Texas, which borders Maverick County to the east.

This FIS report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the NFIP.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting Federal Insurance and Mitigation Division, FEMA Region VI, Federal Regional Center, 800 North Loop 288, Denton, Texas 76201.

9.0 BIBLIOGRAPHY AND REFERENCES

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9. Water Development Board, Engineering Data on Dams and Reservoirs in Texas, Part 111, Report 126, February 1971.

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11. Topographic Mapping, Scale 1:3,000, Contour Interval 2 feet.

12. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS River Analysis System Versions 2.2, Davis, California, September 1998.

13. Federal Insurance Administration, Flood Insurance Study and Flood Insurance Rate Map, City of Eagle Pass, Maverick County, Texas, Washington D.C., October 19, 2005.

14. National Geodetic Survey. VERTCON version 2.10. Silver Spring, MD. September 2003.

15. Federal Emergency Management Agency, Flood Insurance Rate Map, Maverick County, Texas (Unincorporated Area), Washington, D.C., December 20, 1977.

16. Federal Emergency Management Agency, Flood Insurance Study, Webb County and Incorporated Areas, Texas, Washington D.C., April 2, 2008.

ELEVATION IN FEET (NAVD)

670 680 690 700 710 720 730 740 750 760

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH RIO GRANDE

0 500 1,000 1,500 2,000 2,500 3,000 3,500 4,000 4,500 5,000 5,500 6,000 6,500

CONFLUENCE WITH RIO GRANDE

FLOODING CONTOLLED BY RIO GRANDE

GOLF CART CROSSING

S ADAMS ST

1% ANNUAL CHANCE BACKWATER EFFECTS FROM RIO GRANDE

US HWY 57

N MONROE ST

US HWY 57

NORTH CEYLON STREET

CONFLUENCE OF EAGLE PASS CREEK TRIBUTARY 1

UP RR

PIERCE ST

US HWY 57

E RIO GRANDE ST

US HWY 277 BUSINESS

US HWY 277 BUSINESS

A B C D E

LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- A CROSS SECTION LOCATION

01P

FEDERAL EMERGENCY MANAGEMENT AGENCY

MAVERICK COUNTY, TX
AND INCORPORATED AREAS

FLOOD PROFILES

EAGLE PASS CREEK

ELEVATION IN FEET (NAVD)

700 710 720 730 740 750 760 770 780 790

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH RIO GRANDE

6,500 7,000 7,500 8,000 8,500 9,000 9,500 10,000 10,500 11,000 11,500 12,000 12,500 13,000

F G H I

QUARRY ST
FORD ST
LEONA ST
FERRY ST
MEDINA ST
CONCHO ST
TRINITY ST
COLORADO ST
N COMAL ST
KELSO DR

CONFLUENCE OF
EAGLE PASS CREEK TRIBUTARY 2

LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- A CROSS SECTION LOCATION

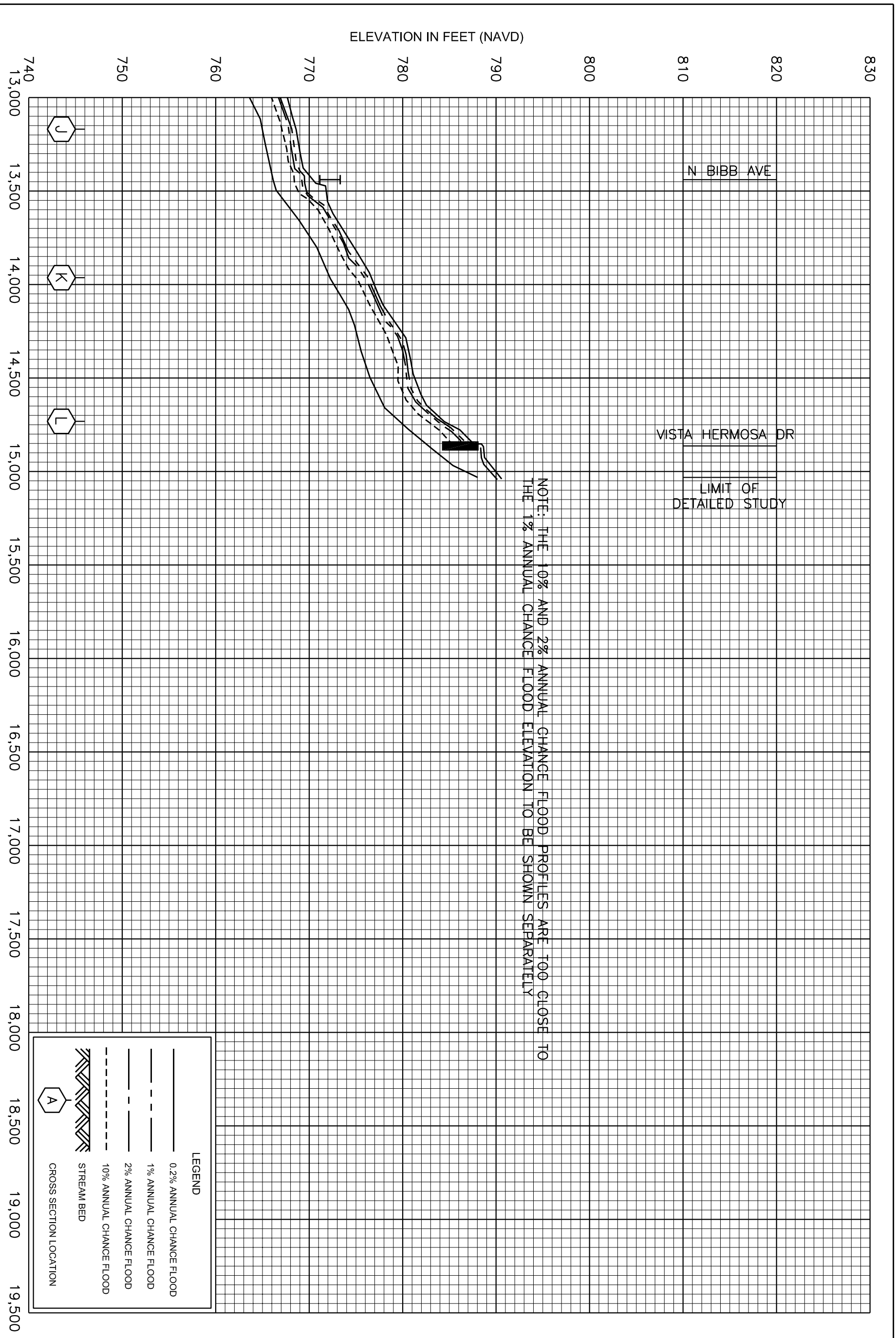
02P

FEDERAL EMERGENCY MANAGEMENT AGENCY

MAVERICK COUNTY, TX
AND INCORPORATED AREAS

FLOOD PROFILES

EAGLE PASS CREEK



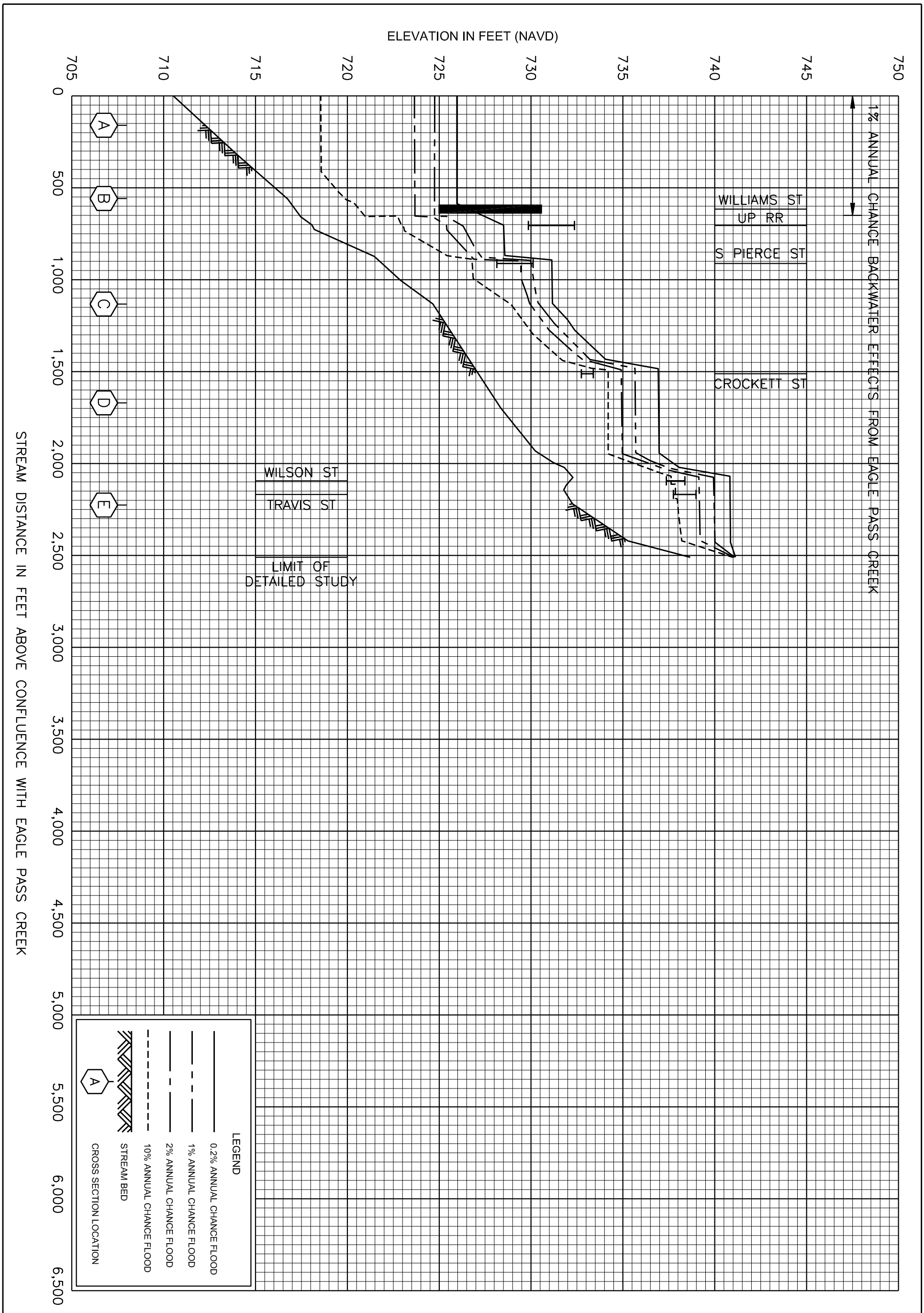
03P

FEDERAL EMERGENCY MANAGEMENT AGENCY

MAVERICK COUNTY, TX
AND INCORPORATED AREAS

FLOOD PROFILES

EAGLE PASS CREEK



04P

FEDERAL EMERGENCY MANAGEMENT AGENCY

MAVERICK COUNTY, TX
AND INCORPORATED AREAS

FLOOD PROFILES

EAGLE PASS CREEK TRIBUTARY 1

ELEVATION IN FEET (NAVD)

730 735 740 745 750 755 760 765 770 775

0 500 1,000 1,500 2,000 2,500 3,000 3,500 4,000 4,500 5,000 5,500 6,000 6,500

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH EAGLE PASS CREEK

CONFLUENCE WITH EAGLE PASS CREEK

1ST ST

2ND ST

CONCHO ST

HILDALGO ST

TRINITY ST

COLORADO ST

ARLINGTON ST

MEMORIAL DR

A B C D E

LEGEND

0.2% ANNUAL CHANCE FLOOD

1% ANNUAL CHANCE FLOOD

2% ANNUAL CHANCE FLOOD

10% ANNUAL CHANCE FLOOD

STREAM BED

A CROSS SECTION LOCATION

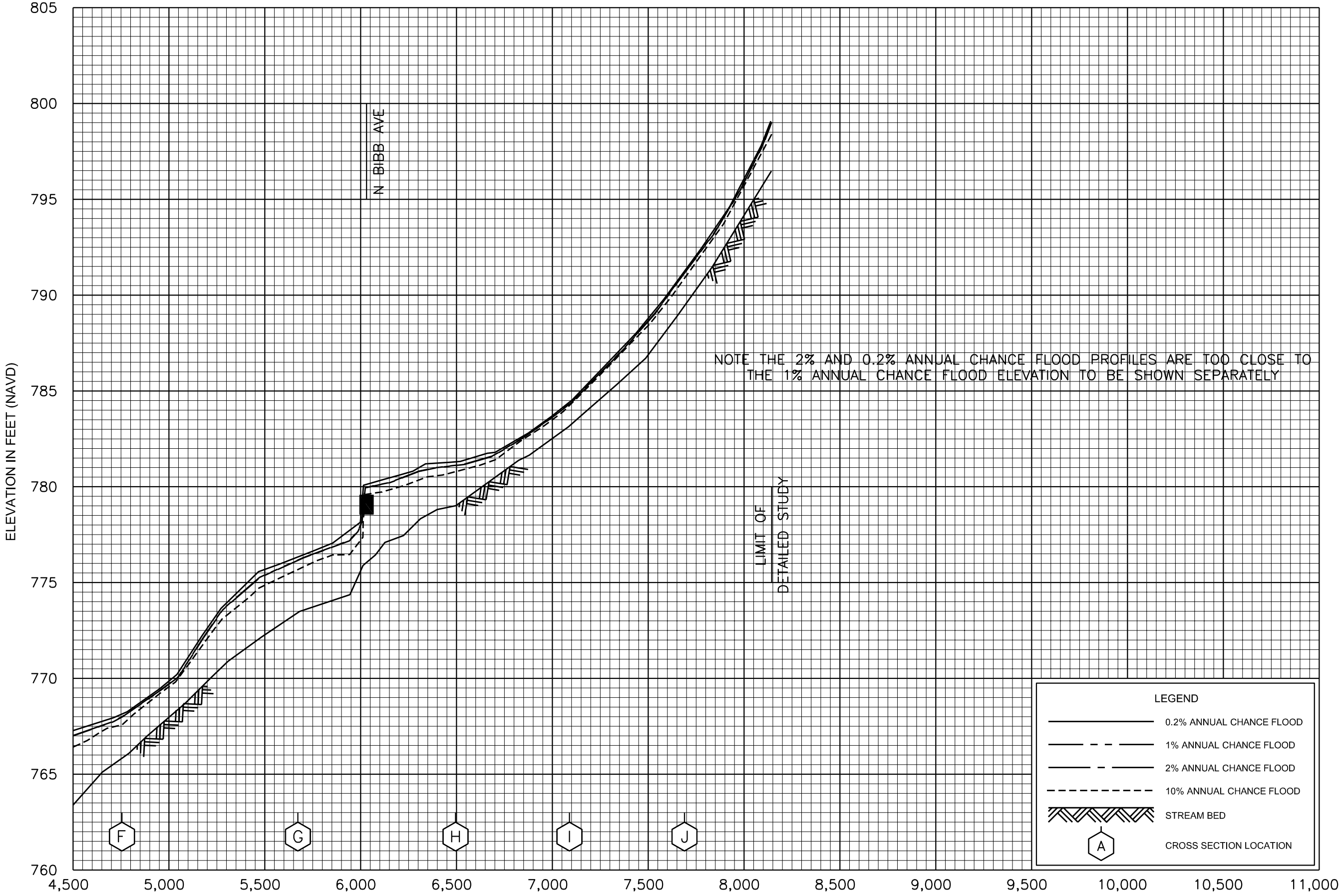
05P

FEDERAL EMERGENCY MANAGEMENT AGENCY

MAVERICK COUNTY, TX
AND INCORPORATED AREAS

FLOOD PROFILES

EAGLE PASS CREEK TRIBUTARY 2



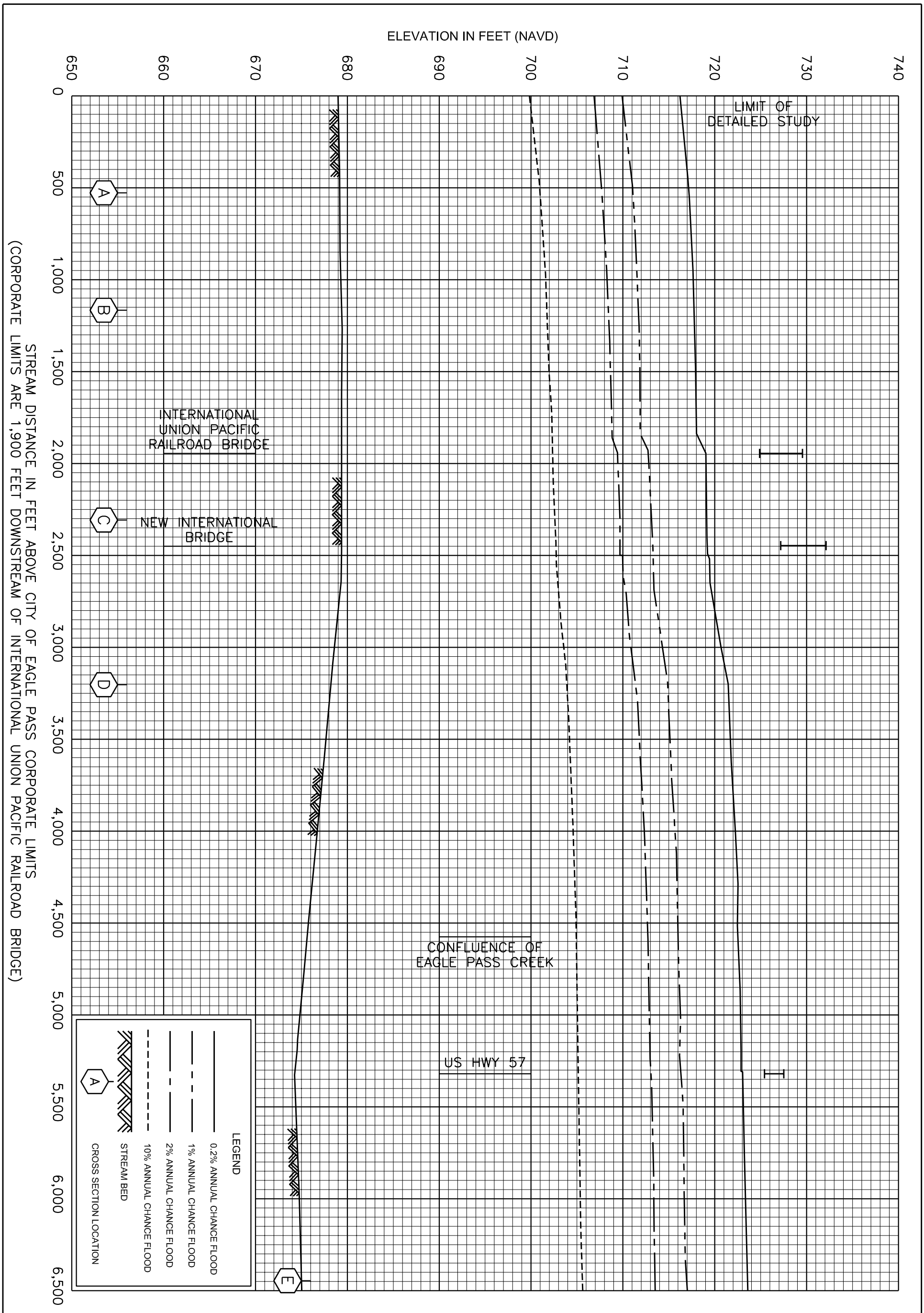
FLOOD PROFILES

EAGLE PASS CREEK TRIBUTARY 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

MAVERICK COUNTY, TX
AND INCORPORATED AREAS

06P



07P

FEDERAL EMERGENCY MANAGEMENT AGENCY

MAVERICK COUNTY, TX
AND INCORPORATED AREAS

FLOOD PROFILES

RIO GRANDE

740
730
720
710
700
690
680
670
660
650

ELEVATION IN FEET (NAVD)

6,500 7,000 7,500 8,000 8,500 9,000 9,500 10,000 10,500 11,000 11,500 12,000 12,500 13,000

STREAM DISTANCE IN FEET ABOVE CITY OF EAGLE PASS CORPORATE LIMITS
(CORPORATE LIMITS ARE 1,900 FEET DOWNSTREAM OF INTERNATIONAL UNION PACIFIC RAILROAD BRIDGE)

F

G

LIMIT OF DETAILED STUDY

LEGEND

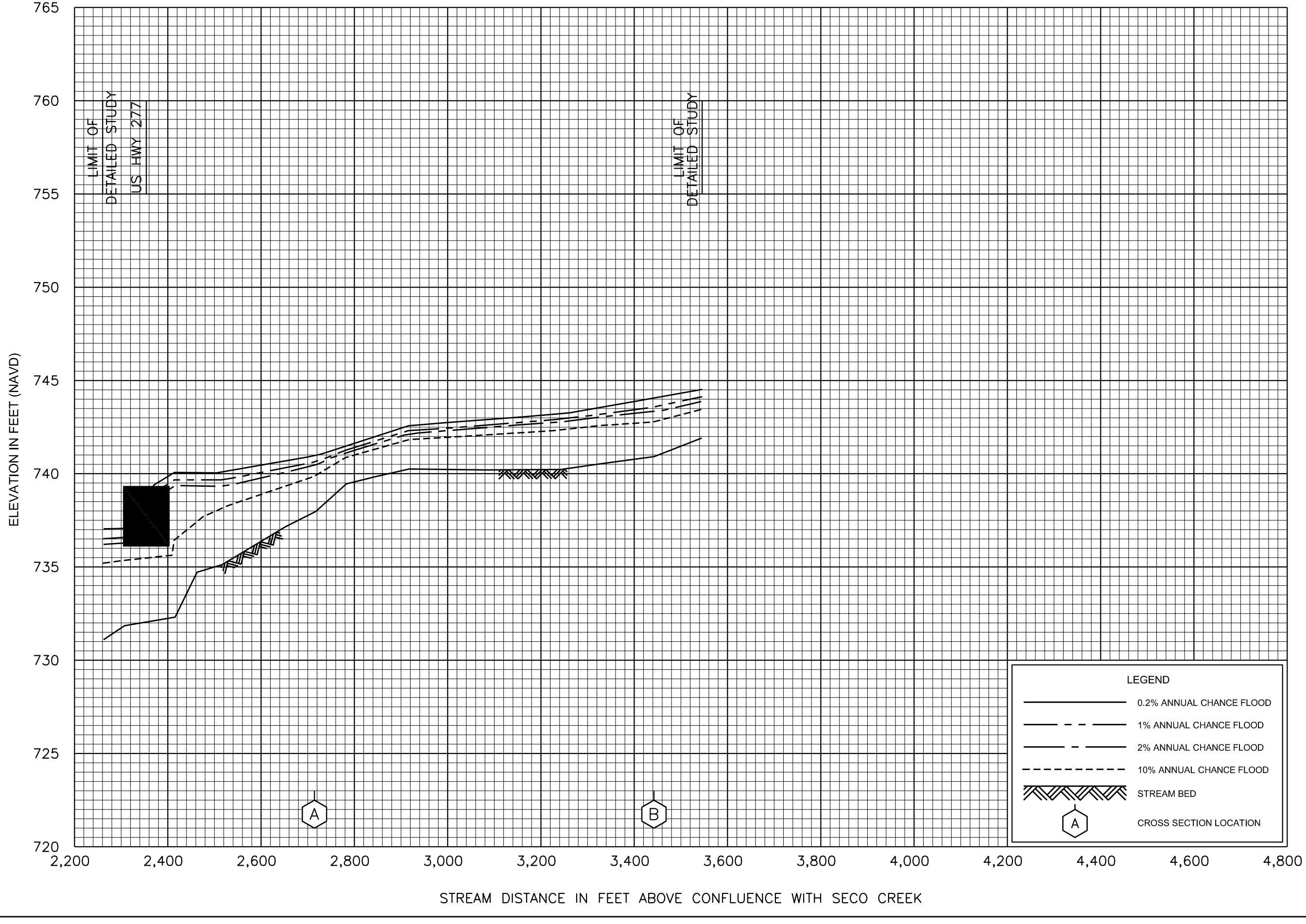
- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- A — CROSS SECTION LOCATION

FLOOD PROFILES

RIO GRANDE

FEDERAL EMERGENCY MANAGEMENT AGENCY

MAVERICK COUNTY, TX
AND INCORPORATED AREAS



FLOOD PROFILES

TRIBUTARY TO SECO CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MAVERICK COUNTY, TX
AND INCORPORATED AREAS

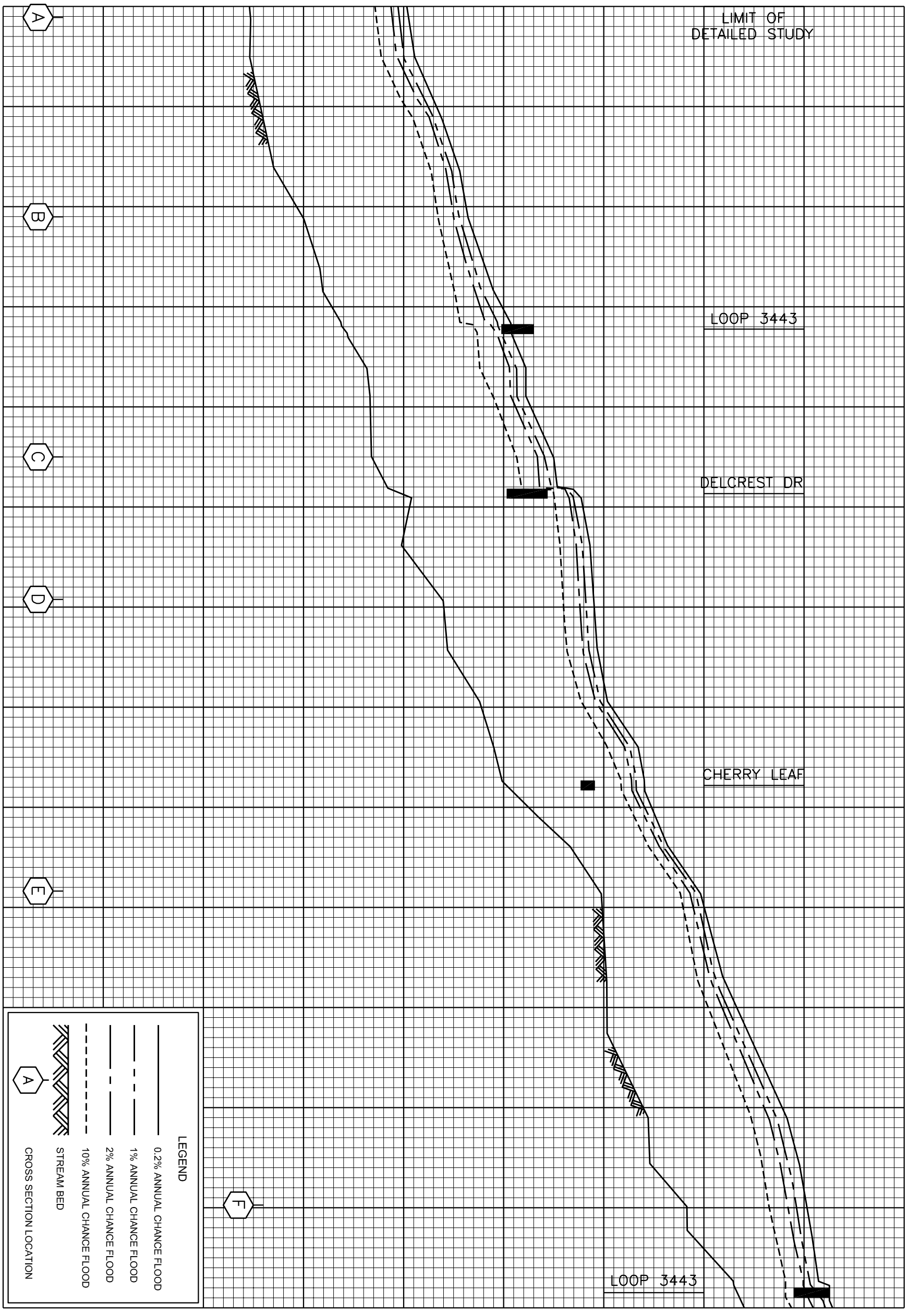
09P

ELEVATION IN FEET (NAVD)

720 725 730 735 740 745 750 755 760 765

0 500 1,000 1,500 2,000 2,500 3,000 3,500 4,000 4,500 5,000 5,500 6,000 6,500

STREAM DISTANCE IN FEET ABOVE CITY OF EAGLE PASS CORPORATE LIMITS
(CORPORATE LIMITS ARE APPROXIMATELY 1,630 FEET DOWNSTREAM OF LOOP 3443)



10P

FEDERAL EMERGENCY MANAGEMENT AGENCY

MAVERICK COUNTY, TX
AND INCORPORATED AREAS

FLOOD PROFILES

UNNAMED TRIBUTARY OF RIO GRANDE

ELEVATION IN FEET (NAVD)

750 755 760 765 770 775 780 785 790 795

6,500 7,000 7,500 8,000 8,500 9,000 9,500 10,000 10,500 11,000 11,500 12,000 12,500 13,000

STREAM DISTANCE IN FEET ABOVE CITY OF EAGLE PASS CORPORATE LIMITS
(CORPORATE LIMITS ARE APPROXIMATELY 1,630 FEET DOWNSTREAM OF LOOP 3443)

US HWY 57

LIMIT OF DETAILED STUDY

G

H

LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- A CROSS SECTION LOCATION

011P

FEDERAL EMERGENCY MANAGEMENT AGENCY

MAVERICK COUNTY, TX
AND INCORPORATED AREAS

FLOOD PROFILES

UNNAMED TRIBUTARY OF RIO GRANDE